BK PRECISION®

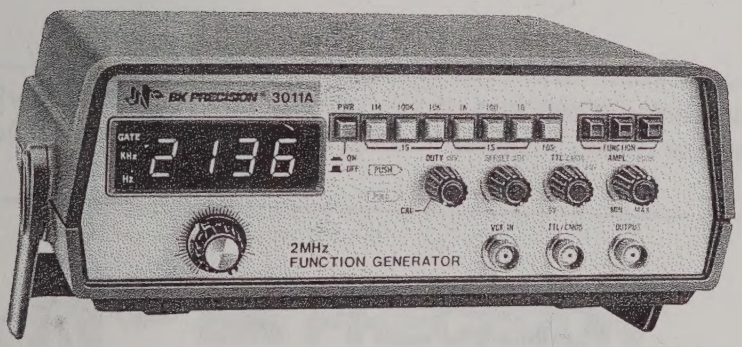
SERVICE MANUAL

FOR

MODELS 3011, 3011A & 3011B

2 MHz FUNCTION GENERATOR

with Digital Display



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REFERENCE PUBLICATIONS

	B&K-Precision Publication No.
Model 3011 Instruction Manual	480-511-9-001
Model 3011A Instruction Manual	480-639-9-001
Model 3011B Instruction Manual	480-653-9-001
Model 3011 Schematic Diagrams & Parts List	499-333-9-001
Model 3011A & 3011B Schematic Diagram & Parts List	499-394-9-001
Model 3011, 3011A & 3011B Calibration Procedure	494-244-9-001
B & K-Precision Guidebook to Function Generators	480-652-9-001

MODEL 3011 SPECIFICATIONS

(All specifications apply with frequency dial between 0.2 and 2 times range).

Basic Outputs: Sine Wave, Triangle Wave, Square Wave, TTL Pulse, and CMOS Pulse.

Frequency Range: 0.2 Hz to 2 MHz (7 ranges). Four digit frequency counter display.

Maximum Amplitude: 20 V p-p (open circuit). 10 V p-p (into 50 Ω load).

Amplitude Control: Continuously variable, 30 dB range typical.

Attenuator: -20 dB ± 1 dB.

Output Impedance: 50 Ω ± 6%.

DC Offset: Continuously variable, from -10 V to +10 V (open circuit), -5 V to +5 V into 50 Ω.

Duty Cycle Control: Continuously variable from 1:1 to 10:1.

Sine Wave Function:

Distortion: 0.2 Hz to 20 kHz; ≤ 1%, 20 kHz to 200 kHz; ≤ 2%.

Frequency Response: 0.2 Hz to 100 kHz, ≤ 0.2 dB, 100 kHz to 2 MHz; ≤ 1 dB.

Square Wave Function:

Symmetry: 0.2 Hz to 100 kHz; ≤ 2%.

Rise Time: ≤ 120 ns.

Triangle Wave Linearity: 0.2 Hz to 100 kHz; 98%, 100 kHz to 2 MHz; 95%.

TTL Output:

Level: ≥ 3 V p-p.

Rise Time: ≤ 30 ns.

CMOS Output:

Level: Continuously adjustable from 4 V p-p (± 1 V p-p) to 14.5 V p-p (± 0.5 V p-p).

Rise Time: ≤ 120 ns.

VCF (Voltage Controlled Frequency) Input:

Input Voltage: Approximately +10 V (± 1 V) causes 10:1 frequency change.

Impedance: Approximately 10 kΩ.

Frequency Counter (Internal Only):

Accuracy: ±Time Base Accuracy ±1 Count.

Time Base Accuracy: ±10 PPM (23° C ± 5° C).

Power Source: 120/220/240 V AC ± 10%, 50/60 Hz.

Weight: 5.5 lb (2.5 kg).

Dimensions (W x H x D): 9.33 x 3.33 x 11.18", 237 x 85 x 284 mm.

Accessories Supplied:

One cable, BNC to insulated clips.
Power Cord.
Spare Fuse.
Instruction Manual.
Schematic Diagrams & Parts List.

MODEL 3011A SPECIFICATIONS

(All specifications apply with frequency dial between 0.2 and 2 times range).

Basic Outputs: Sine Wave, Triangle Wave, Square Wave, TTL Pulse, and CMOS Pulse.

Frequency Range: 0.2 Hz to 2 MHz (7 ranges). Four digit frequency counter display.

Maximum Amplitude: 20 V p-p (open circuit). 10 V p-p (into 50 Ω load).

Amplitude Control: Continuously variable, 20 dB range typical.

Attenuator: -20 dB ± 1 dB.

Output Impedance: 50 Ω ± 6%.

DC Offset: Continuously variable, from -10 V to +10 V (open circuit), -5 V to +5 V into 50 Ω.

Duty Cycle Control: Continuously variable from 1:1 to 10:1.

Sine Wave Function:
- Distortion: 0.2 Hz to 20 kHz; ≤ 1%, 20 kHz to 200 kHz; ≤ 2%.
- Frequency Response: 0.2 Hz to 100 kHz, ≤ 2 dB, 100 kHz to 2 MHz; ≤ 1 dB.

Square Wave Function:
- Symmetry: 0.2 Hz to 100 kHz; ≤ 2%;
- Rise Time: ≤ 120 ns.

Triangle Wave Linearity: 0.2 Hz to 100 kHz; 98%, 100 kHz to 2 MHz; 95%.

TTL Output:
- Level: ≥ 3 V p-p.
- Rise Time: ≤ 30 ns.

CMOS Output:
- Level: Continuously adjustable fro 4 V p-p (± 1 V p-p) to 14.5 V p (± 0.5 V p-p).
- Rise Time: ≤ 120 ns.

VCF (Voltage Controlled Frequency) Input:
- Input Voltage: Approximately +10 V (± 1 causes 10:1 frequency chang
- Impedance: Approximately 10 kΩ.

Frequency Counter (Internal Only):
- Accuracy: ± Time Base Accuracy ± Count.
- Time Base Accuracy: ± 10 PPM (23° C ± 5° C).

Power Source: 120/220/240 V AC ± 10% 50/60 Hz.

Weight: 5.5 lb (2.5 kg).

Dimensions (W x H x D): 9.65 x 3.75 x 11", 245 x 95 x 280 mm.

Accessories Supplied: One cable, BNC to insulate clips.
Power Cord.
Spare Fuse.
Instruction Manual.
Schematic Diagram & Par List.

MODEL 3011B SPECIFICATIONS

(All specifications apply with coarse frequency dial between 0.2 and 2 times range).

Basic Output: Sine Wave, Triangle Wave, Square Wave, TTL Pulse, and CMOS Pulse.

Frequency Range: 0.2 Hz to 2 MHz (7 ranges). Four digit frequency counter display.

Frequency Control: Separate coarse and fine tuning controls.

Maximum Amplitude: 20 V p-p (open circuit).
10 V p-p (into 50 Ω load).

Amplitude Control: Continuously variable, 20 dB range typical.

Attenuator: -20 dB ± 1 dB.

Output Impedance: 50 Ω ± 6%.

DC Offset: Continuously variable, from -10 V to +10 V (open circuit), -5 V to +5 V into 50 Ω.

Duty Cycle Control: Continuously variable from 1:1 to 10:1.

Sine Wave Function:
- Distortion: 0.2 Hz to 20 kHz; ≤ 1%, 20 kHz to 200 kHz; ≤ 2%.
- Frequency Response: 0.2 Hz to 100 kHz, ≤ 0.2 dB, 100 kHz to 2 MHz; ≤ 1 dB.

Square Wave Function:
- Symmetry: 0.2 Hz to 100 kHz; ≤ 2%.
- Rise Time: ≤ 120 ns.

Triangle Wave
Linearity: 0.2 Hz to 100 kHz; 98%, 100 kHz to 2 MHz; 95%.

TTL Output:
- Level: ≥ 3 V p-p.
- Rise Time: ≤ 30 ns.

CMOS Output:
- Level: Continuously adjustable from 4 V p-p (± 1 V p-p) to 14.5 V p-p (± 0.5 V p-p).
- Rise Time: ≤ 120 ns.

VCF (Voltage Controlled Frequency) Input:
- Input Voltage: Approximately +10 V (± 1 V) causes 10:1 frequency change.
- Impedance: Approximately 10 kΩ.

Frequency Counter (Internal Only):
- Accuracy: ± Time Base Accuracy ± 1 Count.
- Time Base Accuracy: ± 10 PPM (23° C ± 5° C).

Power Source: 120/220/240 V AC ± 10%, 50/60 Hz.

Weight: 5.5 lb (2.5 kg).

Dimensions (W x H x D): 9.65 x 3.75 x 11", 245 x 95 x 280 mm.

Accessories Supplied:
One cable, BNC to insulated clips.
Power Cord.
Spare Fuse.
Instruction Manual.
Schematic Diagram & Parts List.

GENERAL CIRCUIT DESCRIPTION

(See Block Diagram and Schematic Diagram)

The basic waveform generated in the Model 3011 is the triangle wave. This is accomplished by charging and then discharging a capacitor by equal magnitude currents. A dual comparator and flip-flop determine whether the capacitor is being charged or discharged. When the voltage on the capacitor reaches the positive limit, the charging current is switched off and the capacitor discharges until the lower limit is reached at which time the charging current is then reapplied. The output of the dual comparator is a square wave.

To produce a sine wave, the triangle is shaped by a special amplifier. Range switching is accomplished by changing the magnitude of the current sources and the timing capacitor. Dial frequency tuning is done by changing the magnitude of the current sources. A frequency change of over a 10:1 is possible with the frequency dial. Below is a table of the capacitors and currents used.

The peak-to-peak voltage of the triangle generated is 2 V. The frequency of operation is determined by the currents, the capacitor value and the peak-to-peak voltage of the triangle wave.

$$f = \frac{1}{2T}$$

and;

$$T = \frac{(C)(Vpp)}{I}$$

therefore,

$$f = \frac{I}{2(C)(Vpp)}$$

Thus for I = 0.8 mA, C = 1 µF and Vpp = 2V

$$f = \frac{0.8mA}{(2)(1\,\mu F)(2)} = 200Hz$$

RANGE	FREQUENCY (10:1)	CAPACITOR	CURRENT
1	0.2 Hz - 2 Hz	1 µF (C207)	0.8 µA - 8 µA
10	2 Hz - 20 Hz	1 µF (C207)	8 µA - 80 µA
100	20 Hz - 200 Hz	1 µF (C207)	80 µA - 0.8 mA
1K	200 Hz - 2 KHz	0.1 µF (C206)	80 µA - 0.8 mA
10K	2 KHz - 20 KHz	0.01 µF (C205)	80 µA - 0.8 mA
100K	20 KHz - 200 KHz	0.001 µF (C204)	82 µA-0.82 mA
1M	200 KHz - 2 MHz	100pF(C203,VC201)	0.12 mA-1.2 mA

ETAILED CIRCUIT DESCRIPTION

I. FUNCTION GENERATOR SECTION

A. VCF Summing / Frequency Control Voltage Reference (U201)

The current from the VCF input is normally zero and the output of U201, an operational amplifier, sits at 0V. This along with the -15V is the reference for the Frequency controls. +10V applied to the VCF input sets the output of U201 to -15V due to the action of R201 and R202, setting the minimum voltage across the frequency controls. The generator may be swept or frequency modulated by applying a ramp or AC waveform to the VCF input.

B. Current Source Driver (U203,Q201)

U203 is an operational amplifier and Q201 is a source follower used in conjunction with the operational amplifier. U203 and Q201 are connected as a voltage follower with a closed loop gain of +1. The voltage at the source of Q201 follows the input voltage of U203 pin 3. The voltage at the drain of Q201 tracks the voltage at the source but is of opposite polarity. In this way the current source driver provides both current sources with equal voltages.

C. Positive Current Source (U204,Q202)

The current sources provide five switchable sets of currents. U204 and Q202 are connected as a voltage follower. The voltage at the emitter of Q202 is equal to the voltage at the input to U204 pin 2. On any selected range, the current, produced, **2I**, is equal to the +15V supply minus the voltage at the emitter of Q202, divided by the appropriate resistance R_{T1} (R208, R210, R212 or R214).

D. Negative Current Source (U205,Q203)

The voltage across R209 is equal and opposite to the voltage across R208. U205 and Q203 are connected as a voltage follower similar to U204 and Q203. The voltage at the emitter of Q203 is equal to the voltage at the input to U205 pin 2. On any selected range, the current, produced, **I**, is equal to the -15V supply minus the voltage at the emitter of Q203, divided by the appropriate resistance R_{T2} (R209, R211, R213 or R215).

E. Diode Gates (D201,D202)

The diode gates are silicon diodes D201 and D202. The purpose of the diode gates is to either switch the output of the positive current source to the capacitors to charge them, or to shunt the current so that the negative current source can discharge the capacitors. The gates work as follows:

1. If the signal from the level detector, U301, is high-level TTL (+5V), it reverse biases diode D202 and cuts it off. Diode D201 now becomes forward biased and all the current, **2I**, flows thru D201. Since the negative current source can only sink **-I** current, a net positive current, **I**, is seen by the capacitors and they are linearly charged to produce a positive ramp.

2. If the signal from the level detector, U301, is low-level TTL (0V), it forward biases diode D202 and the level detector sinks all the current, **2I**, from the positive current source. Diode D201 now becomes reverse biased and no current flows thru it. The capacitors now see only the negative current source with **-I** current and are linearly discharged to produce a negative ramp.

F. Timing Capacitors (C203-C207,VC201)

The timing capacitors are chosen for such highly desirable qualities as:

1. Low dissipation factor.
2. Low temperature coefficient.
3. Long term capacitance stability.

G. Triangle Buffer (Q205-Q209)

The triangle buffer has a very high impedance to minimize leakage currents and prevent loading of the timing capacitors. Q204 is the high impedance buffer to the capacitors while Q205 provides temperature compensation to Q204. Q206 is an emitter follower and is used to provide the necessary current to drive the level detector, sine shaper, etc. The three transistors Q207, Q208 and Q209 used as diodes along with the base-emitter junction of Q206 shifts the triangle waveform seen at the emitter of Q206 up to four diode drops (about 2.5V) so that the diode gates can switch properly with a TTL level signal from the level detector.

H. Dual Level Detector and Flip-Flop (U301)

The level detector, U301, senses the level of the ramp input (either positive or negative) and switches output states when the input reaches any one of two voltage limit references. The device, a 75107 line receiver, has a dual differential input comparator stage and a dual three-input NAND gate output stage connected as an R-S Flip-Flop. The input limit voltage references are set by two voltage dividers on the tracking +15V and -15V supplies. Resistors R301 and R302 set +1V for the minus input of one comparator, pin 11. Resistors R303 and R304 set -1V for the plus input of the other comparator, pin 1. Capacitor C302 couples a small positive feedback from one output of the line receiver, pins 5 & 9, to the inputs, pins 2 & 12, to speed up the switching.

I. TTL Buffer / Square Wave Level Shifter (U302)

U302A, a 74S04 Hex Inverter, is used for buffering U301. U302B in conjuntion with S301 is used to invert the TTL and Square waves. U302C shifts the TTL output of the level detector, U301, so that it is approximately symmetrical about zero with VR303 providing a Fine DC Offse adjustment. VR301 provides an amplitude adjustment for the square wave. U302C is used to drive the CMOS Buffer. U302D & U302E are connected in parallel to increase the TTL drive capability of the TTL Pulse Output.

J. CMOS Buffer (U303,Q301)

Q303 is used as a +5V TTL to +15V CMOS level shifter with U303D as a buffer U303A,B, and C are connected in paralle to increase the CMOS drive capability of the CMOS Pulse Output with VR302 the Fron Panel CMOS ADJ. control.

K. Sine Wave Shaper (U401)

The sine wave shaper takes a triangle wave input and non-linearly shapes it t produce a sine wave. The shaper utilize the non-linear relationship of a differentioa pair of transistors. The output is taken fror one collector of the pair and buffered an level-shifted by the two other transistors i the package (U401). Trimpot VR40 adjusts the amplitude of the sine wave an VR404 adjusts its DC level at the outpu Trimpots VR402 and VR403 are adjusted t provide the lowest distortion of the sin wave.

L. Output Amplifier (Q501-Q507)

The output amplifier consists of differential input stage (Q501 and Q502 followed by a common emitter transisto Q503. The output from Q503 is applied t a push-pull output stage (Q506 and Q507 Feedback is applied from the output to th base of Q502 by R510, R511, C501 an VC501. The Front Panel Amplitude Contr is VR502. The closed loop gain i approximately 10. DC Offset is obtained b applying the offset voltage to the base c Q502 via S502 and VR501 in the prese mode or Front Panel Offset Control VR50 in the DC Offset mode.

M. Power Supply

One secondary winding of power transformer TS101, diode bridge BD101 and filter capacitors C101 and C102 generate +24V and -24V unregulated. The +24V is applied to U101, a 7815 voltage regulator, which generates the +15V supply. The -24V is applied to U102 and Q101 comprise a -15V regulator which is referenced to the +15V via R101 and R102. The -24V is also applied to Q102 and D102 which comprise the -5V supply.

The other secondary winding of TS101, diode bridge BD102 and filter capacitor C108 generate +11V unregulated. The +11V is applied to U103 and U104, 7805 voltage regulators, which generate the +5V supply and the VCC supply (+5V for the frequency counter section).

II. FREQUENCY COUNTER SECTION

The frequency counter is U608, a 74C926, 4-Digit Counter with Multiplexed 7-Segment Output Drivers which is able to drive the Function Generator Displays directly. All the other ICs are used to provide the time base gating, function generator signal gating, and the counter latch and reset signals to U608. Time base references of 0.1, 1 and 10 seconds are determined by the Front Panel Range switches. Function generator signals, either direct, or divided by 10 or 100, are gated by the three gate times to provide a maximum of four digits resolution whenever possible.

A. TIME BASE OSCILLATOR / DIVIDERS

U601 is a crystal oscillator/divider that utilizes a 3.58 MHz TV color crystal between pins 5 & 6. The output of U601 (pin 1), a 60Hz square waveform with a 45% duty cycle is used to drive Q601. Q601 buffers CMOS U601 and is used to drive U602, a 74LS92, a divide by 12 counter. The Q3 output of U602 is a divide by 6, 10Hz TTL square waveform. The 10Hz signal feeds U603, a 4518 dual decade divider, which produces a divide by 10, 1Hz TTL 20% duty cycle signal on pin 6 and a divide by 100 0.1Hz TTL 20% duty cycle signal on pin 14.

B. TIME BASE GATING

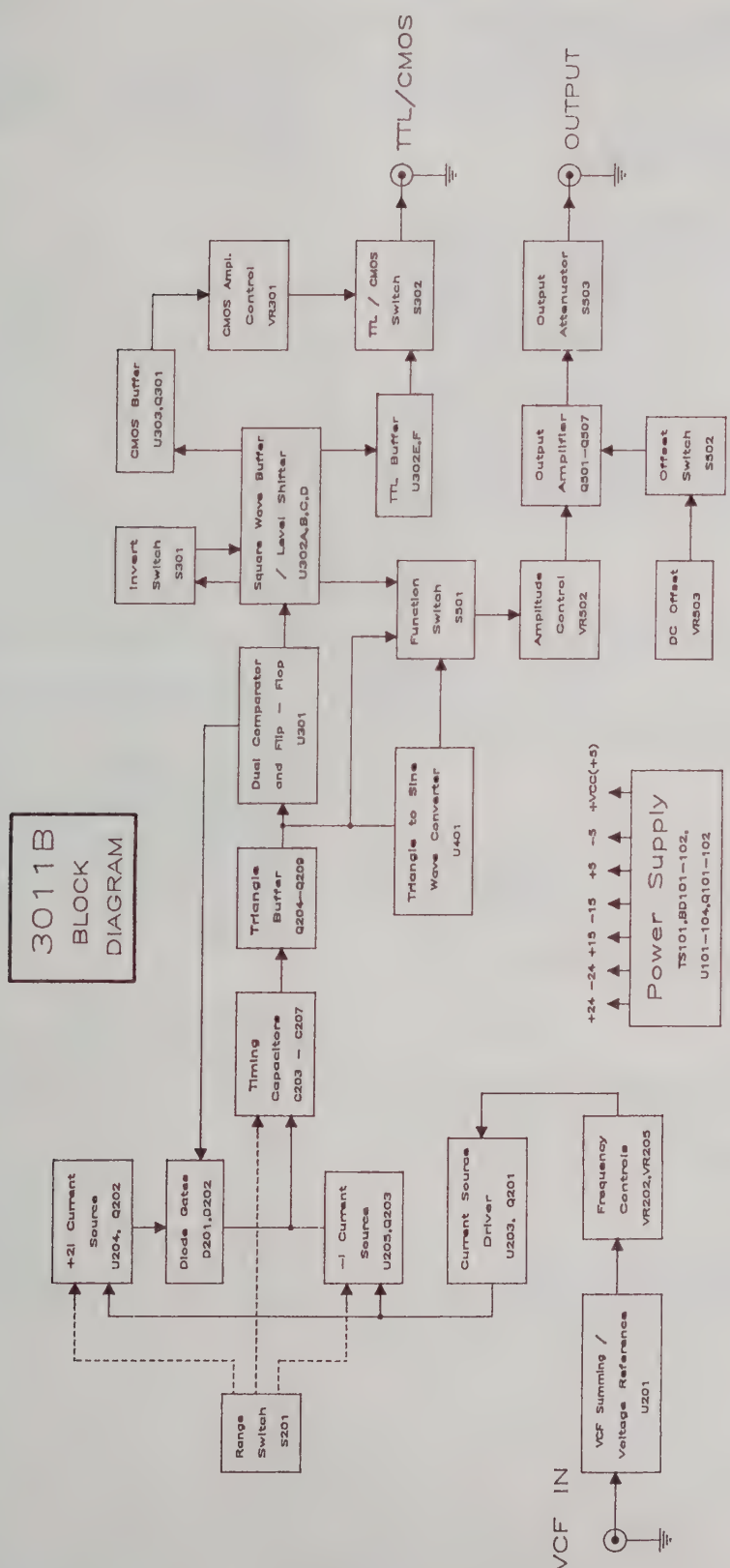
Sections of U604, U605 and U606 along with Q602, pass the proper gated time function generator signal to U608 under control of the Front Panel Range switches. U604D (pins 11,12,13) gates 10Hz, U605A (pins 1,2 8,9) gates 1Hz and U604C (pins 8,9,10) gates 0.1Hz under control of S201D. U605C (pins 10,11,12,13) gates the selected 0.1, 1,or 10Hz time base signal. Q602 Buffers the CMOS U605 and drives U602 pin 14. The Q0 output of U602 pin 12 is a divide by 2 TTL square wave of 0.05, 0.5, or 5Hz. This is the actual time base that is used to gate the function generator signal thru U606C (pins 8,9,10) and into U608. This time base signal is a TTL square wave that is either on/off for .1/.1s, 1/1s, or 10/10s.

C. FUNCTION GENERATOR SIGNAL DIVIDER / GATING

U609 along with sections of U604 and U605 route the function generator signal either direct, or divided by 10 or 100 thru to U608 under control of the Front Panel Range switches. U609 is a 4518 dual decade divider that divides the function generator signal by 10 and 100. The input is pin 1 and the divide by 10 signal is on pin 6. The signal from pin 6 is feed to pin 9 and the divide by 100 signal is on pin 14. U606B (pins 4,5,6) gates the direct signal, U604B (pins 4,5,6) gates the divide by 10 signal, and U604A (pins 1,2,3) gates the divide by 100 signal under control by S201D. U605B (pins 3,4,5,6) gates the selected function generator signal.

D. COUNTER LATCH AND RESET SIGNAL

U607 along with with sections of U606 is used to generate the Latch and Reset signals to U608 for proper operation. U606D (pins 11,12,13) holds U607 in its reset mode while the Function generator signal is being gated to the counter U608. When the Function generator signal is not being gated, U606A (pins 1,2,3) gates the 60 Hz signal from Q601 to U607. U607 is a decade divider with 10 decoded outputs. Pin 1 is the "1" output and is used as the Latch signal to U608 which loads the decade counter outputs within U608 into its latches for display. U607 pin 7 is the "3" output and is used to reset the four decade dividers within U608 back to zero in preparation for the next gated counting sequence.


3011B
BLOCK
DIAGRAM
VCF IN
VCF Summing / Voltage Reference U201
Frequency Controls VR202,VR205
Range Switch S201
+2I Current Source U204, Q202
Diode Gates D201,D202
-I Current Source U205,Q203
Current Source Driver U203, Q201
Timing Capacitors C203 - C207
Triangle Buffer Q204-Q208
Dual Comparator and Flip - Flop U301
Triangle to Sine Wave Converter U401
Square Wave Buffer / Level Shifter U302A,B,C,D
Invert Switch S301
CMOS Buffer U303,Q301
CMOS Ampl. Control VR301
TTL Buffer U302E,F
TTL / CMOS Switch S302
TTL/CMOS
Function Switch S301
Amplitude Control VR302
DC Offset VR303
Output Amplifier Q301-Q307
Offset Switch S302
Output Attenuator S303
OUTPUT
+24 -24 +15 -15 +5 -5 +VCC(+5)
Power Supply
TS101,BD101-102,
U101-104,Q101-102

WARNING

The following instructions are for use by qualified service personnel only. To avoid electrical shock, do not perform servicing other than contained in the operating instructions unless you are qualified to do so.

Remember that ac line voltage is present on line voltage input circuits any time the instrument is plugged into an ac outlet, even if turned off. Always unplug the Function Generator before performing service procedures.

DISASSEMBLY AND REASSEMBLY

In order to access the fuse and the line voltage selector, the bottom half of the case must be removed. To remove the bottom of the case:

Disassembly

1. Unplug the Function Generator and turn the unit upside down. Remove the four screws and the rubber foot pads from the bottom of the unit.
2. Lift up the bottom section of the case.

Reassembly

1. Line up the slots in the bottom case half with the front panel and put the two case halves together.
2. Replace the rubber foot pads and screws.

LINE VOLTAGE SELECTION

1. If the line voltage needs to be changed, disassemble the function generator case (see DISASSEMBLY section above) and unplug the plastic connector by pulling it straight up (see Fig.1 for location).

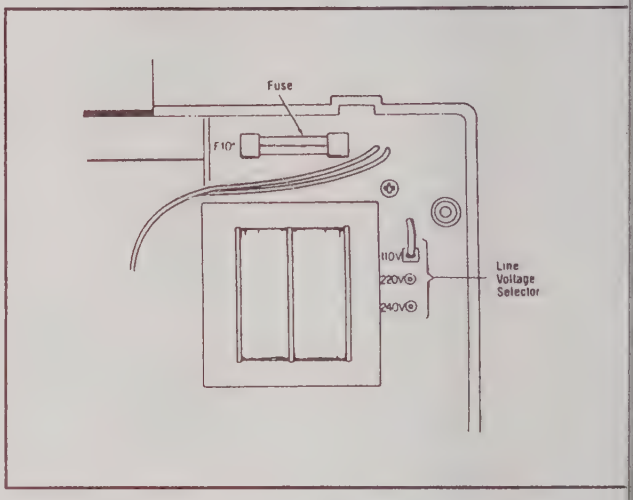


Fig. 1. Fuse And Line Voltage Selector Location

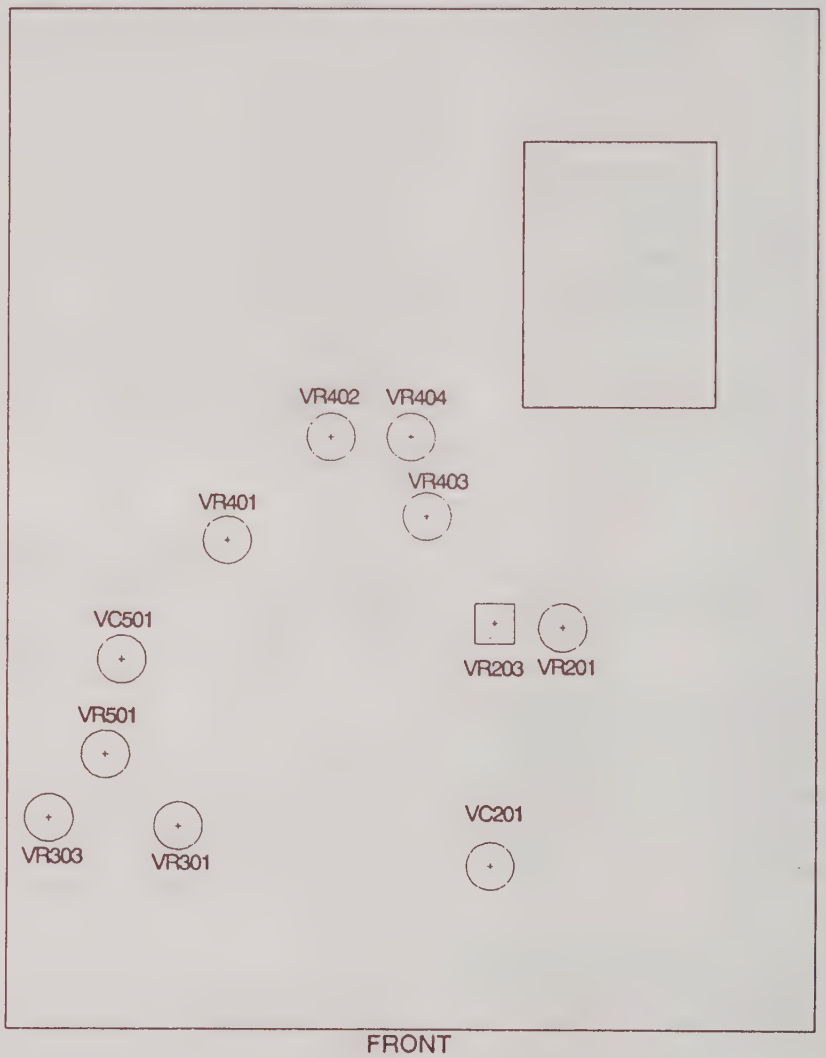
2. Align the plastic connector with the desired voltage selector pin and push the plug down over the pin. Be sure that the correct fuse is installed (0.5 A for 110 V operation and 0.3 A for 220 or 240 V operation) in the fuse holder. Reassemble the case.

FUSE REPLACEMENT

1. To replace the fuse, disassemble the case and remove the blown fuse (see Fig. 1 for location).
2. The fuse should not normally open unless a problem has developed with the unit. Try to determine and correct the cause of the blown fuse, then replace only with correct value fuse (0.5 A for 110 V operation and 0.3 A for 220 or 240 V operation). Reassemble the case.

INSTRUMENT REPAIR SERVICE

Because of the specialized skills and test equipment required for instrument repair and calibration, many customers prefer to rely upon **B & K-Precision** for this service. We maintain a network of **B & K-Precision** authorized service agencies for this purpose. There is a nominal charge for instruments out of warranty.



CALIBRATION PROCEDURE

Allow a 30 minute warm-up before beginning this procedure. Use a non-metallic tool for all adjustments, and perform them in the order specified. The following test equipment is required:

Standard DMM	50 ohm Termination
Distortion Meter	Oscilloscope

Cover Removal

1. Unplug the function generator and swing the handle so that it is flat against the top of the case.
2. Turn the unit upside down.
3. Remove the four screws from the bottom of the case.
4. Lift the bottom cover off. Remove the handle and four case separators (cylindrical plastic standoffs) and set aside.

Square Wave Symmetry Adjustment

1. Depress the 1 k RANGE switch on the 3011 and select the square wave FUNCTION. Turn the DUTY control to CAL (fully counterclockwise), and turn the AMPL control to MAX (fully clockwise). Push in the DUTY, OFFSET ADJ, TTL, and AMPL controls.
2. Adjust FREQUENCY control for approximately 1000 Hz.
3. Connect the OUTPUT of the 3011 to an oscilloscope. Set the oscilloscope to 5V / DIV and .1 mS/DIV.
4. Adjust VR203 for a duty cycle of 49.5% to 50.5%.

Full Scale Adjustment

1. Set Fine FREQUENCY control to center (3011B only), and set coarse FREQUENCY control to last major increment in clockwise direction.
2. Adjust VR201 for a reading 1990 to 2010 Hz.
3. Depress the 1M RANGE switch.
4. Adjust VC201 for a reading of 1990 to 2010 kHz.

Triangle Wave DC Offset Adjustment

1. Depress the 1 k RANGE switch and triangle FUNCTION switch.
2. Pull out AMPL control and set to MIN (fully counterclockwise).
3. Disconnect the OUTPUT of the 3011 from the oscilloscope and connect it to the input of the DMM. Set DMM to read DC Volts.
4. Adjust VR501 for a reading on DMM between -10 mV and +10 mV.

Sine Wave Distortion Adjustment

1. Depress the Sine FUNCTION switch.
2. Push IN the AMPL control and set to MAX (fully clockwise).
3. Disconnect the OUTPUT of the 3011 from the DMM and connect it to the input of the distortion meter and a 50 ohm terminator.

4. Adjust VR401 and VR403 for less than 0.7% distortion.
5. Remove 50 ohm terminator and recheck distortion.

Sine Wave Level Adjustment

1. Disconnect the OUTPUT of the 3011 from the distortion meter and connect it to the input of the oscilloscope.
2. Depress Triangle FUNCTION switch and note amplitude of triangle waveform on oscilloscope.
3. Depress sine FUNCTION switch.
4. Adjust VR402 until sine wave amplitude is within ±1% of triangle wave amplitude.

Sine Wave DC Offset Adjustment

1. Pull OUT the AMPL control and set to MIN (fully counterclockwise).
2. Disconnect the OUTPUT of the 3011 from the oscilloscope and connect it to the input of the DMM.
3. Adjust VR404 for a reading on DMM between -100 mV and 100 mV.

Square Wave Level Adjustment

1. Disconnect the OUTPUT of the 3011 from the DMM and connect it to the input of the oscilloscope.
2. Push in AMPL control and set to MAX (fully clockwise).
3. Depress Triangle FUNCTION switch and note amplitude of triangle waveform on oscilloscope.
4. Depress Square FUNCTION switch.
5. Adjust VR301 until square wave amplitude is within ±1% of triangle wave amplitude.

Square Wave DC Offset Adjustment

1. Pull OUT the AMPL control and set to MIN (fully counterclockwise).
2. Disconnect the OUTPUT of the 3011 from the oscilloscope and connect it to the input of the DMM.
3. Adjust VR303 for a reading on the DMM between -100 mV and 100 mV.
4. Disconnect the OUTPUT of the 3011 from the DMM and connect it to the input of the oscilloscope.
5. Push in AMPL control and set to MAX (fully clockwise).

Square Wave Rise and Fall Time Adjustment

1. Depress 100 K RANGE switch and adjust FREQUENCY FOR 200 kHz.
2. Connect 50 ohm terminator to oscilloscope input.
3. Adjust VC501 for square wave rise and fall times of 100 nS or less. Overshoot must be less than 1 small increment on oscilloscope.
4. Remove 50 ohm terminator from oscilloscope input.
5. Overshoot must be less than 1 small increment on oscilloscope with oscilloscope controls set so that display is the same amplitude as in Step 3.

SCHEMATIC SYMBOL	DESCRIPTION	B&K PRECISION PART NUMBER
	RESISTORS	
	Unlisted resistors are ± 5%, 1/4 W	
	See Schematic for value	
R101,102	10 kΩ ± 1%, 1/4 W Metal Film	.015-144-1-002
R104	820 Ω ± 5%, 1/2 W Carbon	.002-102-5-821
R105	1.8 kΩ ± 5%, 1/2 W Carbon	.002-102-5-182
R205	2.61 kΩ ± 1%, 1/4 W Metal Film	.015-144-2-611
R206	2.21 kΩ ± 1%, 1/4 W Metal Film	.015-144-2-211
R207	4.99 kΩ ± 1%, 1/4 W Metal Film	.015-144-4-991
R208	2.49 kΩ ± 1%, 1/4 W Metal Film	.015-144-2-491
R209	4.99 kΩ ± 1%, 1/4 W Metal Film	.015-144-4-991
R210	3.65 kΩ ± 1%, 1/4 W Metal Film	.015-144-3-651
R210A	187 Ω ± 1%, 1/4 W Metal Film	.015-144-1-870
R211	7.32 kΩ ± 1%, 1/4 W Metal Film	.015-144-7-321
R211A	174 Ω ± 1%, 1/4 W Metal Film	.015-144-1-740
R212	37.4 kΩ ± 1%, 1/4 W Metal Film	.015-144-3-742
R213	75 kΩ ± 1%, 1/4 W Metal Film	.015-144-7-502
R214	374 kΩ ± 1%, 1/4 W Metal Film	.015-144-3-743
R215	750 kΩ ± 1%, 1/4 W Metal Film	.015-144-7-503
R301	14.3 kΩ ± 1%, 1/4 W Metal Film	.015-144-1-432
R302	1 kΩ ± 1%, 1/4 W Metal Film	.015-144-1-001
R303	14.3 kΩ ± 1%, 1/4 W Metal Film	.015-144-1-432
R304	1 kΩ ± 1%, 1/4 W Metal Film	.015-144-1-001
R306,307	221 Ω ± 1%, 1/4 W Metal Film	.015-144-2-210
R308	1.74 kΩ ± 1%, 1/4 W Metal Film	.015-144-1-741
R401,402	10 Ω ± 1%, 1/4 W Metal Film	.015-144-1-008
R403	1.91 kΩ ± 1%, 1/4 W Metal Film	.015-144-1-911
R404	340 Ω ± 1%, 1/4 W Metal Film	.015-144-3-400
R405-407	1 kΩ ± 1%, 1/4 W Metal Film	.015-144-1-001
R408	750 Ω ± 1%, 1/4 W Metal Film	.015-144-7-500
R409	270 Ω ± 1%, 1/4 W Metal Film	.013-010-9-014
R410	100 kΩ ± 1%, 1/4 W Metal Film	.015-144-1-003
R411	511 Ω ± 1%, 1/4 W Metal Film	.015-144-5-110
R412	1 kΩ ± 1%, 1/4 W Metal Film	.015-144-1-001
R413	1.21 kΩ ± 1%, 1/4 W Metal Film	.015-144-1-211

SCHEMATIC SYMBOL	DESCRIPTION	B&K PRECISION PART NUMBER
	RESISTORS (continued)	
R512,513	2 kΩ ± 5%, 1/2 W Carbon	.002-102-5-202
R514,515	47 Ω ± 5%, 1 W Carbon	.002-001-5-470
R518,519	100 Ω ± 1%, 1/2 W Metal Film	.015-124-1-000
R520	499 Ω ± 1%, 1/2 W Metal Film	.015-124-4-990
R521	56.2 Ω ± 1%, 1/2 W Metal Film	.015-124-5-628
VR201	4.7 kΩ Trimmer Potentiometer	.010-026-9-003
VR202	5 kΩ Potentiometer (Frequency Control)	.008-845-9-001
VR203	470 Ω Trimmer Potentiometer	.010-026-9-006
VR204/ S301	50 kΩ Potentiometer w/Switch (DUTY/INV)	.008-845-9-003
VR301	1 kΩ Trimmer Potentiometer	.010-026-9-002
VR302/ S302	1 kΩ Potentiometer w/Switch (TTL/CMOS Control)	.008-845-9-002
VR303	220 Ω Trimmer Potentiometer	.010-026-9-001
VR401	100 Ω Trimmer Potentiometer	.010-025-9-001
VR402	1 kΩ Trimmer Potentiometer	.010-026-9-002
VR403	100 kΩ Trimmer Potentiometer	.010-026-9-005
VR404	1 kΩ Trimmer Potentiometer	.101-026-9-002
VR501	10 kΩ Trimmer Potentiometer	.010-026-9-004
VR502/ S503	1kΩ Potentiometer w/Switch (AMPLitude Control)	.008-845-9-002
VR503/ S502	50 kΩ Potentiometer w/Switch (OFFSET Control)	.008-845-9-003
	CAPACITORS	
C101,102	1000 µF, 35 V Electrolytic	.022-335-9-004
C103-105	47 µF, 25 V Electrolytic	.022-328-9-001
C106	10 µF, 25 V Electrolytic	.022-335-9-003
C107	47 µF, 25 V Electrolytic	.022-328-9-001
C108	4700 µF, 16 V Electrolytic	.022-335-9-001
C109	100 µF, 16 V Electrolytic	.022-335-9-002
C110	0.1 µF, 12 V Disc	.020-385-9-001
C201,202	0.047 µF, 25 V Disc	.020-385-9-003
C203	90 pF ± 5%, 50 V NPO Disc	.031-069-9-004
C204	0.001 µF ± 1%, 100 V Metalized Polyester	.025-250-9-001
C205	0.01 µF ± 1%, 100 V Metalized Polyester	.025-250-9-002
C206	0.1 µF ± 1%, 100 V Metalized Polyester	.025-250-9-003

SCHEMATIC SYMBOL	DESCRIPTION	B&K PRECISION PART NUMBER
	CAPACITORS (continued)	
C207	1.0 µF ± 1%, 100 V Metalized Polyester	.025-250-9-004
C208,209	0.01 µF, 12 V Disc	.020-385-9-002
C301	10 µF, 25 V Electrolytic	.022-335-9-003
C302	10 pF ± 1/2 pF 50 V NPO Disc	.031-068-9-002
C303,304	10 µF, 25 V Electrolytic	.022-335-9-003
C305	0.047 µF, 25 V Disc	.020-385-9-003
C306	0.1 µF, 12 V Disc	.020-385-9-001
C309,310	0.1 µF, 12 V Disc	.020-385-9-001
C401,402	0.047 µF, 25 V Disc	.020-385-9-003
C501	2 pF ± 1/2 pF 50 V NPO Disc	.031-068-9-001
C502,503	22 µF, 50 V Electrolytic	.022-335-9-005
C504	100 pF ±5%, 50 V NPO Disc	.031-068-9-005
C505,506	0.047 µF, 25 V Disc	.020-385-9-003
C601,602	22 pF ± 5%, 50 V NPO Disc	.031-068-9-003
C603-605	0.1 µF, 12 V Disc	.020-385-9-001
VC201,501	5-16 pF Variable Capacitor	.028-093-9-001
	TRANSISTORS & DIODES	
Q101,102	2SB507E PNP Silicon Transistor	.177-094-9-001
Q201	2N5485 N-Channel Field-Effect Transistor	.182-067-9-001
Q202	2SA1015GR PNP Silicon Transistor	.177-057-9-001
Q203	2SC1815GR NPN Silicon Transistor	.176-095-9-001
Q204,205	2N5485 N-Channel Field-Effect Transistor	.182-067-9-001
Q206-209	2SC1815GR NPN Silicon Transistor	.176-095-9-001
Q301	2SC1815GR NPN Silicon Transistor	.176-095-9-001
Q501,502	2SC1815GR NPN Silicon Transistor	.176-095-9-001
Q503	2SA1015GR PNP Silicon Transistor	.177-057-9-001
Q504,505	2SC1815GR NPN Silicon Transistor	.176-095-9-001
Q506	2N2219A NPN Silicon Transistor	.172-045-9-001
Q507	2N2905A PNP Silicon Transistor	.173-005-9-001
Q601-607	2SC1815GR NPN Silicon Transistor	.176-095-9-001
D101	1 A, 600 V Silicon Diode	.151-050-9-001
D102	5.6 V ± 5%, 1/2 W Zener Diode	.152-072-9-001
BD101,102	Bridge Rectifier Assembly 1 A	.157-038-9-001
D201,202	1N4148 Silicon Diode	.151-038-9-001
D501,502	1N4148 Silicon Diode	.151-038-9-001
D601-614	1N4148 Silicon Diode	.151-038-9-001
D615	LED (Red)	.158-075-9-001

SCHEMATIC SYMBOL	DESCRIPTION	B&K PRECISION PART NUMBER
	TRANSISTORS & DIODES (continued)	
D622,623	LED (Red)	158-075-9-001
DS601-604	7-Segment LED Display (4 required)	283-034-9-001
	INTEGRATED CIRCUITS	
U101	7815	307-081-9-001
U102	741CP	307-018-9-001
U103,104	7805M	307-080-9-001
U201	741CP	307-018-9-001
U203-205	741CP	307-018-9-001
U301	75107N	307-127-9-001
U302	74504	307-208-9-001
U303	4081BN	308-117-9-001
U401	CA3086	307-087-9-001
U601	MM5369	308-370-9-002
U602	74LS92AN	307-422-9-001
U603	4518BE	308-146-9-001
U604	4011BE	308-114-9-001
U605	14023BCP	308-370-9-001
U606	4011BE	308-114-9-001
U607	4017BCN	308-116-9-001
U608	74C926N	308-370-9-003
U609	4518BE	308-146-9-001
	TRANSFORMERS & SWITCHES	
TS-101	Power Transformer	065-214-9-001
S101/ S201	8-Station Pushbutton Switch Assembly (Power/Range)	088-151-9-001
S501	3-Station Pushbutton Switch Assembly (Function)	088-151-9-002
	MISCELLANEOUS	
F101	Fuse, 1/2 A, 250 V 3 AG (110/120 V operation)	191-251-3-102
	0.3 A, 250 V 3 AG (220/240 V operation)	191-010-9-001
X601	3.58 MHz Crystal	132-041-9-001
	Bracket, Transformer Mounting	250-208-9-001
	PC Fuse Clip (2 required)	741-184-9-001
	Power receptacle	770-022-9-001
	AC Line Cord	420-039-9-001

SCHEMATIC SYMBOL	DESCRIPTION	B&K PRECISION PART NUMBER

MISCELLANEOUS (continued)

Handle Insert (2 required)	.746-075-9-001
BNC Connector, Female	.772-024-9-001
Front Panel	.255-246-9-001
Bottom Case	.271-332-9-001
Top Case	.271-331-9-001
Handle	.746-074-9-001
Rubber Foot	.381-151-9-001
Bottom Screw, 3 x 50mm	.634-201-9-001
Knob (Frequency)	.751-314-9-001
Knob (DUTY, AMPLitude, etc)	.751-314-9-002
Switch Button, Brown	.384-079-9-001
Switch Button, Tan	.384-079-9-002
Switch Button, Red	.384-079-9-003
BNC-to Insulated Clips Test Cable	.534-241-0-000
Instruction Manual	.480-511-9-001

PARTS ORDERING INFORMATION

There is a minimum charge for each invoice. Orders will be shipped C.O.D. unless previous open account arrangements have been made or remittance accompanies order. Advance remittance must cover handling, postage or express charges. Specify model and serial number when ordering replacement parts.

ORDER REPLACEMENT PARTS FROM:

B & K-Precision, Factory Service Department

Maxtec International Corporation

6470 West Cortland Street

Chicago, Illinois 60635

Tel (312) 889-1448

SCHEMATIC SYMBOL	DESCRIPTION	B&K PRECISION PART NUMBER
	RESISTORS	
	Unlisted resistors are ± 5%, 1/4 W	
	See Schematic for value	
R101,102	10 kΩ ± 1%, 1/4 W Metal Film	.015-144-1-002
R104	820 Ω ± 5%, 1/2 W Carbon	.002-102-5-821
R105	1.8 kΩ ± 5%, 1/2 W Carbon	.002-102-5-182
R205	2.61 kΩ ± 1%, 1/4 W Metal Film	.015-144-2-611
R206	2.21 kΩ ± 1%, 1/4 W Metal Film	.015-144-2-211
R207	4.99 kΩ ± 1%, 1/4 W Metal Film	.015-144-4-991
R208	2.49 kΩ ± 1%, 1/4 W Metal Film	.015-144-2-491
R209	4.99 kΩ ± 1%, 1/4 W Metal Film	.015-144-4-991
R210	3.65 kΩ ± 1%, 1/4 W Metal Film	.015-144-3-651
R201A	100 Ω ± 1%, 1/4 W Metal Film	.015-144-1-000
R211	7.32 kΩ ± 1%, 1/4 W Metal Film	.015-144-7-321
R211A	174 Ω ± 1%, 1/4 W Metal Film	.015-144-1-740
R212	37.4 kΩ ± 1%, 1/4 W Metal Film	.015-144-3-742
R213	75 kΩ ± 1%, 1/4 W Metal Film	.015-144-7-502
R214	374 kΩ ± 1%, 1/4 W Metal Film	.015-144-3-743
R215	750 kΩ ± 1%, 1/4 W Metal Film	.015-144-7-503
R301	14.3 kΩ ± 1%, 1/4 W Metal Film	.015-144-1-432
R302	1 kΩ ± 1%, 1/4 W Metal Film	.015-144-1-001
R303	14.3 kΩ ± 1%, 1/4 W Metal Film	.015-144-1-432
R304	1 kΩ ± 1%, 1/4 W Metal Film	.015-144-1-001
R306-307	221 Ω ± 1%, 1/4 W Metal Film	.015-144-2-210
R308	1.74 kΩ ± 1%, 1/4 W Metal Film	.015-144-1-741
R401,402	10 Ω ± 1%, 1/4 W Metal Film	.015-144-1-008
R403	1.91 kΩ ± 1%, 1/4 W Metal Film	.015-144-1-911
R404	340 Ω ± 1%, 1/4 W Metal Film	.015-144-3-400
R405-407	1kΩ ± 1%, 1/4 W Metal Film	.015-144-1-001
R408	750 Ω ± 1%, 1/4 W Metal Film	.015-144-7-500
R409	270 Ω ± 1%, 1/4 W Metal Film	.013-010-9-014
R410	100 Ω ± 1%, 1/4 W Metal Film	.015-144-1-003
R411	511 Ω ± 1%, 1/4 W Metal Film	.015-144-5-110
R412	1 kΩ ± 1%, 1/4 W Metal Film	.015-144-1-001
R413	1.21 kΩ ± 1%, 1/4 W Metal Film	.015-144-1-211
R512,513	2 kΩ ± 5%, 1/2 W Carbon	.002-102-5-202

SCHEMATIC SYMBOL	DESCRIPTION	B&K PRECISION PART NUMBER
	RESISTORS (continued)	
R514,515	47 Ω ± 5%, 2 W Carbon	.002-002-5-470
R518,519	100 Ω ± 1%, 1/2 W Metal Film	.015-124-1-000
R520	499 Ω ± 1%, 1/2 W Metal Film	.015-124-4-990
R521	56.2 Ω ± 1%, 1/2 W Metal Film	.015-124-5-628
VR201	4.7 kΩ Trimmer Potentiometer	.010-026-9-003
VR202	5 kΩ Potentiometer (FREQ Control, 3011A)	.008-845-9-001
VR202	5 kΩ Potentiometer (COARSE Control, 3011B)	.008-908-9-001
VR203	470 Ω Trimmer Potentiometer	.010-026-9-006
VR204/ S301	50 kΩ Potentiometer w/Switch (DUTY/INV)	.008-845-9-003
VR205	Dual 500 Ω Potentiometer (FINE Control) (3011B only)	.008-908-9-002
VR301	1 kΩ Trimmer Potentiometer	.010-026-9-002
VR302/ S302	1 kΩ Potentiometer w/Switch (TTL/CMOS Control)	008-845-9-002
VR303	220 Ω Trimmer Potentiometer	.010-026-9-001
VR401	100 Ω Trimmer Potentiometer	.010-025-9-001
VR402	1 kΩ Trimmer Potentiometer	.010-026-9-002
VR403	100 kΩ Trimmer Potentiometer	.010-026-9-005
VR404	1 kΩ Trimmer Potentiometer	.101-026-9-002
VR501	10 kΩ Trimmer Potentiometer	.010-026-9-004
VR502/ S503	1 kΩ Potentiometer w/Switch (AMPLitude Control)	.008-845-9-002
VR503/ S502	50 kΩ Potentiometer w/Switch (OFFSET Control)	.008-845-9-003
	CAPACITORS	
C101-102	1000 µF, 35 V Electrolytic	.022-335-9-004
C103-105	47 µF, 25 V Electrolytic	.022-328-9-001
C106	10 µF, 25 V Electrolytic	.022-335-9-003
C107	47 µF, 25 V Electrolytic	.022-328-9-001
C108	4700 µF, 16 V Electrolytic	.022-335-9-001
C109	100 µF, 16 V Electrolytic	.022-335-9-002
C110	0.1 µF, 12 V Disc	.020-385-9-001
C201,202	0.047 µF, 25 V Disc	.020-385-9-003
C203	90 pF ± 5%, 50 V NPO Disc	.031-069-9-004
C204	0.001 µF ± 1%, 100 V Metalized Polyester	.025-250-9-001
C205	0.01 µF ± 1%, 100 V Metalized Polyester	.025-250-9-002

SCHEMATIC SYMBOL	DESCRIPTION	B&K PRECISION PART NUMBER
	CAPACITORS (continued)	
C206	0.1 µF ± 1%, 100 V Metalized Polyester	.025-250-9-003
C207	1.0 µF ± 1%, 100 V Metalized Polyester	.025-250-9-004
C208,209	0.01 µF, 12 V Disc	.020-385-9-002
C301	10 µF, 25 V Electrolytic	.022-335-9-003
C302	10 pF ± 1/2 pF 50V NPO Disc	.031-068-9-002
C303,304	10 µF, 25 V Electrolytic	.022-335-9-003
C305	0.1 µF, 12 V Disc	.020-385-9-001
C306	0.047 µF, 25 V Disc	.020-385-9-003
C309,310	0.1 µF, 12 V Disc	.020-385-9-001
C401,402	0.047 µF, 25 V Disc	.020-385-9-003
C501	2 pF ± 1/2 pF 50 V NPO Disc	.031-068-9-001
C502,503	22 µF, 50 V Electrolytic	.022-335-9-005
C504	300 pF ±5%, 50 V Disc	.020-386-9-001
C505,506	0.047 µF, 25 V Disc	.020-385-9-003
C601,602	22 pF ± 5%, 50 V NPO Disc	.031-068-9-003
C603-605	0.1 µF, 12 V Disc	.020-385-9-001
VC201,501	5-16 pF Variable Capacitor	.028-093-9-001
	TRANSISTORS & DIODES	
Q101,102	TIP32C PNP Silicon Transistor	.172-080-9-001
Q201	2N5485 N-Channel Field-Effect Transistor	.182-067-9-001
Q202	2SA1015G R PNP Silicon Transistor	.177-057-9-001
Q203	2SC1815G R NPN Silicon Transistor	.176-095-9-001
Q204,205	2N5485 N-Channel Field-Effect Transistor	.182-067-9-001
Q206-209	2SC1815G R NPN Silicon Transistor	.176-095-9-001
Q301	2SC1815G R NPN Silicon Transistor	.176-095-9-001
Q501,502	2SC1815G R NPN Silicon Transistor	.176-095-9-001
Q503	2SA1015G R PNP Silicon Transistor	.177-057-9-001
Q504,505	2SC1815G R NPN Silicon Transistor	.176-095-9-001
Q506	2N2219A NPN Silicon Transistor	.172-014-9-001
Q507	2N2905A PNP Silicon Transistor	.173-005-9-001
Q601-607	2SC1815G R NPN Silicon Transistor	.176-095-9-001
D101	1A, 600 V Silicon Diode	.151-050-9-001
D102	5.6 V. ± 5%, 1/2 W Zener Diode	.152-072-9-001
BD101,102	Bridge Rectifier Assembly 1 A	.157-038-9-001
D201,202	1N4148 Silicon Diode	.151-038-9-001
D501,502	1N4148 Silicon Diode	.151-038-9-001
D601-614	1N4148 Silicon Diode	.151-038-9-001
D615	LED (Red)	.158-114-9-001

SCHEMATIC SYMBOL	DESCRIPTION	B&K PRECISION PART NUMBER
	TRANSISTORS & DIODES (continued)	
D622,623	LED (Red)	.158-114-9-001
DS601-604	7-Segment LED Display (4 required)	.283-034-9-001
	INTEGRATED CIRCUITS	
U101	7815	.307-081-9-001
U102	741CP	.307-016-9-001
U103,104	7805M	.307-080-9-001
U201	741CP	.307-016-9-001
U203-205	741CP	.307-016-9-001
U301	75107N	.307-127-9-001
U302	74504	.307-208-9-001
U303	4081BN	.308-117-9-001
U401	CA3086 (CA3046)	.307-087-9-001
U601	MM5369	.308-370-9-002
U602	74LS92AN	.307-422-9-001
U603	4518BE	.308-146-9-001
U604	4011BE	.308-114-9-001
U605	14023BCP	.308-370-9-001
U606	4011BE	.308-114-9-001
U607	4017BCN	.308-116-9-001
U608	74C926N	.308-370-9-003
U609	4518BE	.308-146-9-001
	TRANSFORMERS & SWITCHES	
TS-101	Power Transformer	.065-214-9-001
S101/ S201	8-Station Pushbutton Switch Assembly (Power/Range)	.088-194-9-002
S501	3-Station Pushbutton Switch Assembly (Function)	.088-151-9-002
	MISCELLANEOUS	
F101	Fuse, 1/2 A, 250 V 3 AG (110/120 V operation)	.191-251-3-102
	0.3 A, 250 V 3 AG (220/240 V operation)	.191-010-9-001
X601	3.58 MHz Crystal	.132-041-9-001
	Bracket, Transformer Mounting	.250-208-9-001
	PC Fuse Clip (2 required)	.741-184-9-001
	Power Receptacle	.770-031-9-001
	AC Line Cord	.420-039-9-001
	Handle Inlay (2 required)	.746-092-9-001

SCHEMATIC SYMBOL	DESCRIPTION	B&K PRECISION PART NUMBER

MISCELLANEOUS (continued)

BNC Connector, Female	.772-024-9-001
Front Panel (3011A)	.255-275-9-001
Front Panel (3011B)	.255-277-9-001
Bottom Case	.271-483-9-001
Top Case	.271-482-9-001
Handle	.746-091-9-001
Rubber Foot	.381-188-9-001
Bottom Screw, 3 x 60 mm	.634-256-9-001
Knob (FREQ, 3011A) (FREQ COARSE, 3011B)	.751-368-9-001
Knob (DUTY, AMPLitude,etc.)	.751-314-9-002
Switch Button, Black	.384-135-9-001
Switch Button, Gray	.384-115-9-002
Switch Button, Red	.384-079-9-003
BNC-to-Insulated Clips Test Cable	.534-241-0-000
Instruction Manual (3011A)	.480-639-9-001
Instruction Manual (3011B)	.480-653-9-001

U.S.A. PARTS ORDERING INFORMATION

There is a minimum charge for each invoice. Orders will be shipped C.O.D. unless previous open account arrangements have been made or remittance accompanies order. Advance remittance must cover handling, postage, or express charges. Specify model and serial number when ordering replacement parts.

ORDER REPLACEMENT PARTS FROM:

B & K-Precision, Factory Service Operations

Maxtec International Corporation

6470 West Cortland Street

Chicago, Illinois 60635

Tel (312) 889-1448

PRODUCTION CHANGES

Between the introduction of Model 3011B and the printing of this service manual, several production changes have occurred. In most cases, replacement parts are not interchangeable between the earlier and later production versions. Use the following information to select the correct replacement parts:

POWER TRANSFORMER

TS101 was 120/220/240 VAC 065-214-9-001
TS101 changed to 100/120/220/240 VAC 065-259-9-002

FUSE

F101 was 1/2 Amp, 250 V, Normal Blow, 3AG 191-251-3-102
Fuse Clip was 741-184-9-001
F101 changed to 0.5 Amp, 250 V, Slow Blow, 5x20 mm 198-300-0-500
Fuse Clip changed to 741-209-9-001

SWITCHES

S201 was 088-194-9-001
S201 changed to 088-206-9-007
S501 was 088-151-9-002
S501 changed to 088-206-9-002
Gray Pushbutton was 384-115-9-002
Gray Pushbutton changed to 384-144-9-001
Black Pushbutton was 384-135-9-001
Black Pushbutton changed to 384-144-9-003
Red Pushbutton was 384-079-9-003
Red Pushbutton changed to 384-144-9-002

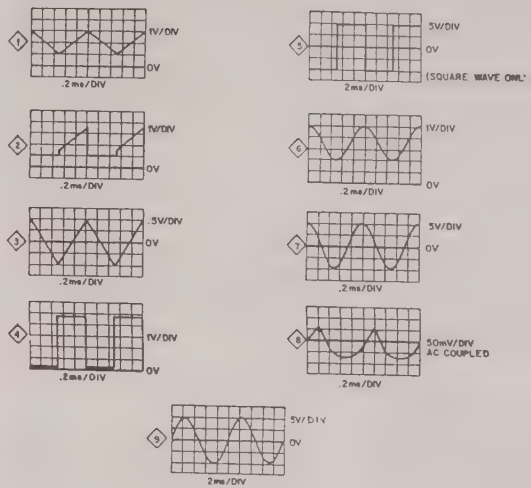
LED DISPLAY

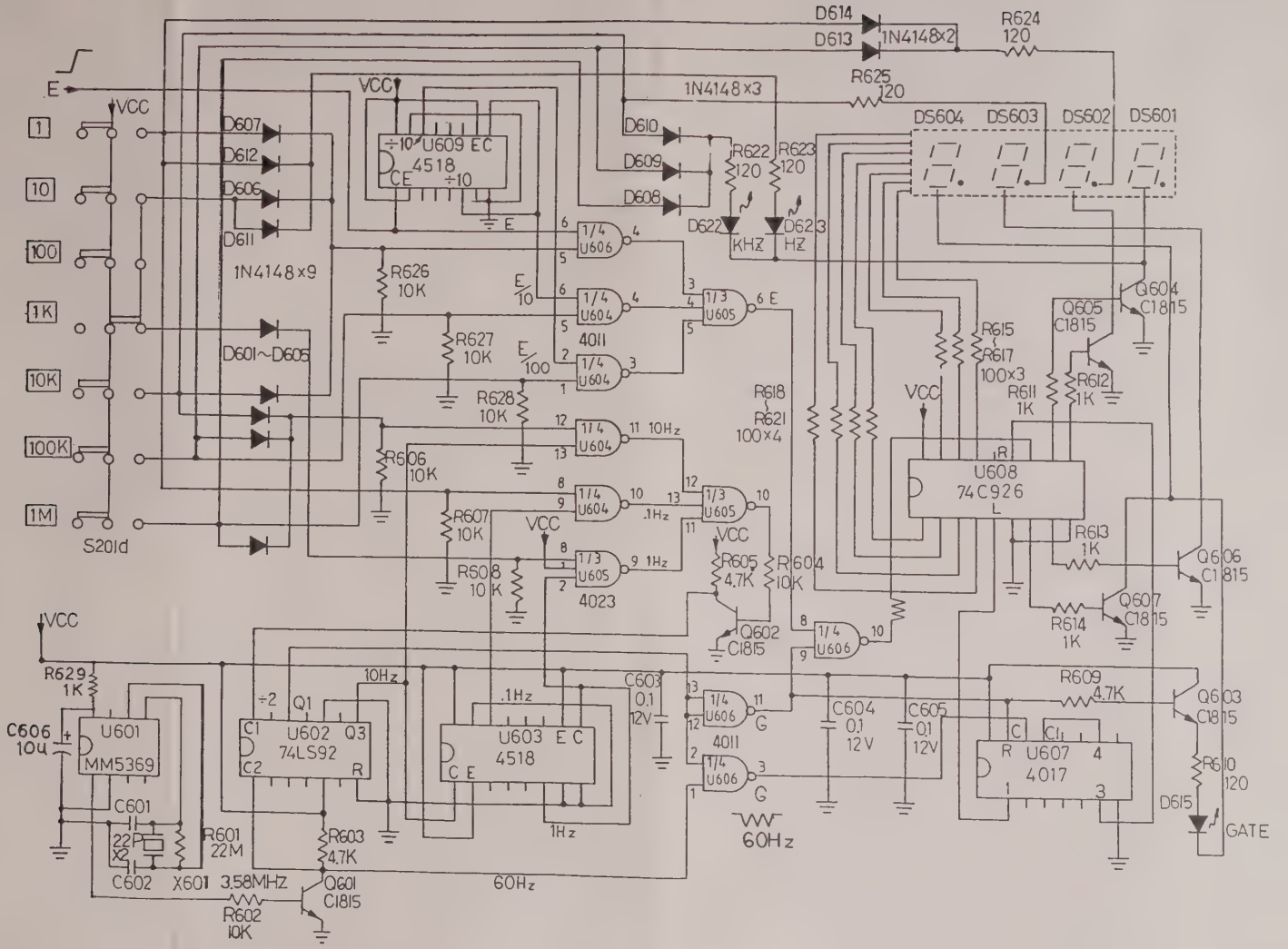
DS601-604 were 238-034-9-001
DS601-604 changed to 238-063-9-004

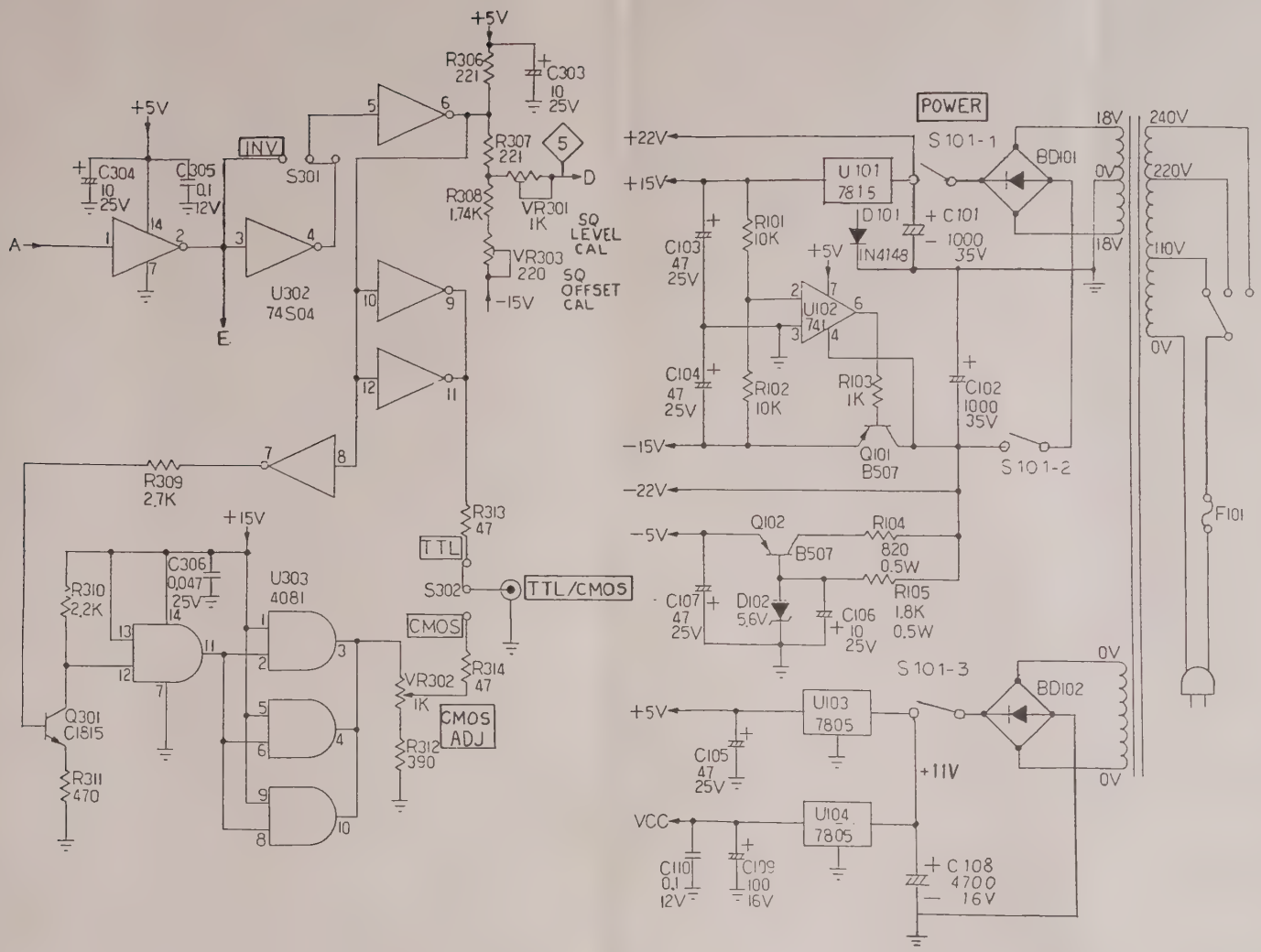
3011B SCHEMATIC WAVEFORMS

These waveforms were observed with the 3011B controls set as follows:

FREQUENCY DISPLAY	1000 Hz
RANGE	1K
FUNCTION	SINEWAVE
AMPLITUDE	10V P-P ACROSS 50Ω
DC OFFSET	OFF
DUTY / INV	CAL / IN




E
VCC
1
10
100
1K
10K
100K
1M
S201d
D607
D612
D606
D611
1N4148×9
D601~D605
÷10 U609 EC
4518
÷10
CE
R626 10K
R627 10K
R628 10K
R606 10K
R607 10K
R608 10K
E/10
E/100
4011
4023
1/4 U606
1/4 U604
1/3 U605
10Hz
.1Hz
1Hz
D614
D613
1N4148×2
R624 120
R625 120
1N4148×3
D610
D609
D608
R622 120
R623 120
D622
D623
KHZ
HZ
DS604 DS603 DS602 DS601
R618 ~ R621 100×4
R615 ~ R617 100×3
R611 1K
R612 1K
R613 1K
R614 1K
Q604 C1815
Q605 C1815
Q606 C1815
Q607 C1815
U608 74C926
R604 10K
R605 4.7K
Q602 C1815
C603 0.1 12V
C604 0.1 12V
C605 0.1 12V
R609 4.7K
Q603 C1815
R610 120
D615
GATE
U607 4017
60Hz
R629 1K
C606 10u
U601 MM5369
C601 22P
X2
C602
X601 3.58MHz
R601 22M
R602 10K
R603 4.7K
Q601 C1815
÷2 Q1
U602 Q3 74LS92
C1
C2
R
U603 EC 4518
C E


+5V
R306 221
C303 10 25V
R307 221
5
D
R308 1.74K
VR301 1K
SQ LEVEL CAL
VR303 220
SQ OFFSET CAL
-15V
INV
S301
C304 10 25V
C305 0.1 12V
A
E
U302 74S04
R309 2.7K
R313 47
TTL
S302
TTL/CMOS
+15V
C306 0.047 25V
U303 4081
R310 2.2K
CMOS
R314 47
VR302 1K
CMOS ADJ
R312 390
Q301 C1815
R311 470
POWER
+22V
+15V
S101-1
U101 7815
BD101
18V
0V
18V
240V
220V
110V
0V
F101
R101 10K
C103 47 25V
D101 IN4148
C101 1000 35V
+5V
U102 741
C104 47 25V
R102 10K
R103 1K
C102 1000 35V
-15V
Q101 B507
S101-2
-22V
-5V
Q102 B507
R104 820 0.5W
R105 1.8K 0.5W
C107 47 25V
D102 5.6V
C106 10 25V
S101-3
BD102
0V
0V
+5V
U103 7805
C105 47 25V
+11V
VCC
U104 7805
C110 0.1 12V
C109 100 16V
C 108 4700 16V

BK PRECISION

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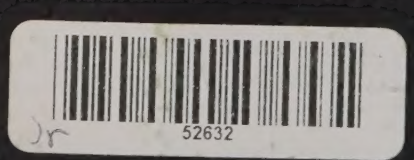

OUP-TANG
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